Contribution ID : **32** Type : **parallel talk**

Transverse momentum spectra of hadrons in p+p collisions at CERN SPS energies from the UrQMD transport model

Friday, 8 June 2018 18:25 (0:20)

Collaboration

Abstract content

The UrQMD transport model, version 3.4, is used to study the new experimental data on total yields, rapidity distributions and transverse momentum spectra of $\pi\pm$, K$\pm$, p and p^- produced in inelastic p+p interactions at SPS energies, recently published by the NA61/SHINE Collaboration. The comparison of model predictions to these new measurements is presented as a function of collision energy for central and forward particle rapidity intervals. In addition, the inverse slope parameters characterising the transverse momentum distributions are extracted from the predicted spectra and compared to corresponding values obtained from experimental distributions, as a function of particle rapidity and collision energy.

A complex pattern of deviations between the experimental data and the UrQMD model emerges. For charged π mesons, the fair agreement visible at top SPS energies deteriorates with decreasing energy. For charged K mesons, UrQMD significantly underpredicts positive kaon production at lower beam momenta. It also underpredicts the central rapidity proton yield at top collision energy and overpredicts antiproton production at all considered energies.

We conclude that new experimental data at SPS energies still constitute a challenge for specific transport models, at least as far as the present version of the UrQMD code is concerned. In view of the importance of the RHIC BES and SPS energy regime which is claimed to host the onset of deconfinement from hadronic matter to quark-gluon plasma in heavy ion collisions, a further discrimination and tuning of model assumptions seems highly indicated as a new step towards a better understanding of the strong interaction at high energy.

This work was recently published in Nuclear Physics A Journal (Nucl.Phys. A973 (2018) 104-115).

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Session Classification : Parallel Session A4